POSITIVE SEP

PATENT SPECIFICATION

(11) 1 225 174

DRAWINGS ATTACHED

1 225 174

(21) Application No. 17105/68 (22) Filed 9 April 1968
(31) Convention Application No. 639 685 (32) Filed 19 May 1967 in
(33) United States of America (US)
(45) Complete Specification published 17 March 1971
(51) International Classification F 16 n 7/16 39/06
(52) Index at acceptance
F2A 37B 48
F2H 11A 12E 17C

(54) VEHICLE DRIVE MECHANISM

(71) We, EATON AXLES LIMITED, a British Company of Victoria Road, Great Sankey, Warrington, Lancashire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a vehicle drive mechanism.

This invention provides a vehicle drive mechanism comprising an axle housing containing a gear chamber and defining a lubricant reservoir in its lower part, a lubricant distribution system having means for removing lubricant from the reservoir and directing it to various parts of the mechanism, and a filter unit in the distribution system, which unit comprises a separate filter housing connected to the axle housing by stud members having lubricant-directing passageways therein which form the lubricant inlet and outlet for the filter housing, and an annular filter element extending across the filter housing and surrounding the outlet stud member.

A preferred embodiment of the present invention will now be described by way of example only with reference to the accompanying drawings.

In the drawings:—

Figure 1 is a perspective view of a vehicle drive of the invention,

Figure 2 is fragmentary sectional view taken approximately along line 3—3 of Figure 2,

Figure 3 is a sectional view taken approximately along line 3—3 of Figure 2,

Figure 4 is an end elevational view of the mechanism shown in Figure 2 in the direction of arrows 4—4,

Figure 5 is an enlarged detail of Figure 2, and

Figure 6 is a perspective, somewhat schematic view of the mechanism of Figure 1.

Referring now to the drawings, there is shewn a rear driving mechanism 10 for a vehicle. The mechanism 10 includes an axle housing 11 having a gear chamber therein. A power transmitting gear unit, which is generally designated 12 (see Figure 6) is located in the gear chamber. The power transmitting gear unit 12 is driven from the drive line of the vehicle in which the axle is utilized by a pinion gear 13 which meshes with a ring gear 14 of the gear unit 12. The ring gear 14 comprises the ring gear of a differential gear mechanism which is contained within a casing 15, and is not shown in the drawings. The differential gear mechanism transmits drive from the ring gear 14 to the axles 17, 18 which drive the opposite rear wheels of the vehicle. The power transmitting gear unit may be of any particular construction and any conventional or suitable gear unit may be utilized, and greater details of the power transmitting gear unit are not necessary to an understanding of the present invention.

The lower portion of the housing 11 defines a lubricant reservoir 11*a* which contains lubricant that is to be distributed to various parts of the mechanism during the operation of the axle. In order to effect the distribution of the lubricant through the axle, the ring gear 14 rotates through the lubricant reservoir 11*a*. The ring gear 14 includes an annular portion 20 which comprises a lubricant pick-up means. The annular portion 20 rotates through the lubricant reservoir and picks up the lubricant and conveys it vertically upwardly, as illustrated by the arrows in Figure 6. Other lubricant is picked up by the gear teeth of the ring gear 14 and is also conveyed upwardly thereby.

The lubricant which is picked up and conveyed by the annular portion 20 of the ring gear 14 is removed from the annular portion 20 by a receiver member 21. The receiver member 21 directs lubricant therefrom to various passageways, not shown, which effect distribution of the lubricant to various parts of the axle, as is well known. For a more detailed disclosure of

the receiver and the lubricant distribution system, reference may be made to Patent Specification No. 994,292.

The mechanism 10 includes a lubricant filter unit 30 (see Figures 1 and 2) which is supported on the housing 11 and is effective to filter lubricant which flows therethrough by removing dirt and other particles from the lubricant. The filter unit 30 includes a filter box assembly or housing 31 which supports a filter element 32 and which is secured to the housing 11 by a pair of stud members 33 and 34. The filter box assembly 31 includes inner and outer dish-shaped members 35 and 36 which are welded together so as to define therebetween a filter chamber 37 in which the filter element 32 is located.

The outer dish-shaped member 36 has an opening 40 therein providing access to the filter chamber 37 for purposes of cleaning and removal of the filter element 32. A reinforcing ring member 41 is secured to the member 36 and projects into the filter chamber 37. The reinforcing ring 41 encircles the opening 40 and provides reinforcement around the opening 40. The reinforcing ring 41 has a plurality of tapped holes 42 at equally spaced locations therearound.

The filter element 32 is a conventional filter member and comprises a filter portion 45 which is located in the filter chamber 37 and opposite support ends or flanges 46 and 47 secured to the ends of the filter portion 45. The filter portion 45 is annular with an opening 45*a* extending axially therethrough. The support flange 46 projects so as to overlap an outer surface portion of the outer dish-shaped member 36. The flange 46 has a plurality of openings 50 (best shown in Figure 5) therein which align with openings 51 in the member 36 and which openings 51, in turn, align with the threaded openings 42 in the reinforcing ring 41.

A circular cover member 60 for the opening 40 in the outer dish-shaped member 36 is secured in position by suitable cap screws 61 which project through openings 62 in the cover member 60 and through the openings 50 and 51 in the flange 46 of the filter element 32 and member 36, respectively. The screws 61 are threaded into the tapped holes 42 in the reinforcing ring 41 and when tightened provide a clamping pressure holding the cover 60 in position, as well as the filter element 32 in the filter chamber 37. The flange portion 47 of the filter element 32 is held in engagement with the inner surface of the inner dish-shaped member 35.

As best seen in Figure 4, there are six screws 61 which are positioned at equally spaced circumferential locations around the opening 40 and around the filter element 32. It should be apparent that the filter element may be removed and replaced by removing the screws 61 and the cover 60 from the member 36. This provides access into the filter chamber 37 and permits removal of the filter element 32 from the filter chamber 37 and the positioning of a new filter element in the filter chamber. The screws 61 can then be repositioned and tightened so as to secure the new filter element in position in the chamber 37.

The stud members 33 and 34 which secure the filter unit 30 to the housing 11 are vertically spaced, with the stud member 33 being located above the stud member 34. The stud members 33 and 34 are threaded into tapped openings 70 and 71, respectively, in the housing 11. The stud members 33 and 34 are locked in position by a locking strap member 72 which cooperates with nuts 73 and 74 which are threaded on to the threaded portion of the studs 33 and 34, respectively. The stud members 33 and 34 extend respectively through openings 75 and 76 in the strap member 72 and the nuts 73 and 74 clamp the strap member 72 against the housing 11. Suitable gaskets 77 are located in position between the strap 72 and the housing 11. The strap member 72 has a pair of tabs 80 at each end thereof. The tabs 80 normally project outwardly as shown in dotted lines in Figure 3 and are bent down into the full line position, as shown in Figure 3, to engage flats on the nuts 73 and 74 respectively. By engagement of the tabs 80 with the flats on the nuts, rotation of the nuts 73 and 74 is prevented, which, in turn, blocks rotation of the stud members 33 and 34 respectively, in the threaded openings in the housing 11. This assists in preventing the studs from loosening from vibration during the operation of the vehicle.

The stud members 33 and 34 have annular shoulder portions 90 and 91 respectively, which are in clamping engagement with the side of the inner dish-shaped member 35 which faces the axle housing. Suitable gaskets 92 are located between the shoulders 90 and 91 and the rear side of the member 35.

The stud member 33 projects through an opening 95 in the inner member 35 and has a neck-down portion which provides a shoulder 96 which clampingly engages the inner surface of the outer member 36. A gasket 97 is located between the shoulder 96 and the inner surface of the outer member 36. The forward end 100 of the stud member 33 is threaded and projects through an opening 101 in the member 36. A lock nut 102 is threaded on to the portion 100 of the stud member 33 and is threaded into tight clamping engagement with the outer

surface of the outer member 36, thereby tightly clamping the filter housing assembly 30 on to the stud member 33 with the gaskets 92 and 93 providing for a tight fluid seal therebetween.

The stud member 34 is constructed similarly to the stud member 33. The stud member 34 projects through a lower opening 95*a* in the inner member 35 and through an opening 101*a* in the cover member 60. A neck-down portion 100*a* of the stud member 34 also projects through an opening 46*a* in the filter element flange 46. A nut 102*a* is threaded on to the neck-down portion 100*a* of the stud member 34 and clamps the assembly 30 securely to the stud member 34. The flange portion 46 of the filter element 32 is sufficiently resilient to provide a fluid-tight seal between itself and the shoulder 96*a* of the stud 34.

The stud member 33 has a drilled passageway 120 axially extended therethrough. This passageway 120, which functions as a lubricant receiving passageway, receives lubricant from the gear chamber of the housing 11 and directs that lubricant into the filter chamber 37 of the filter unit. The end of the stud member 33 which is threaded into the opening 70 in the housing 11 has a projecting hood portion 121 which projects into the chamber. The hood portion 121 which is of a U-shape, as best seen in Figures 3 and 6, projects adjacent the rotating gear 14 and specifically adjacent the rotating teeth of the gear 14. The line designated 122 in Figure 2 indicates generally the path of movement of the ring gear 14 and shows generally the relative position between the hood member 121 and the path of movement of the ring gear adjacent thereto. Lubricant which is carried by the ring gear 14 is splashed or thrown against the underside of the hood 121 and directed into the passageway 120. This fluid flows axially along the passageway 120 and is directed into the filter chamber 37 through the radial passageway 120*a* which communicates with the passageway 120 and with the filter chamber 37. The lubricant then flows by gravity downwardly through the annular filter portion 45.

The stud member 34 also has a passageway therethrough which is designated 130. The passageway 130 communicates with the filter chamber 37 through a radially extending passageway or opening 131. The lubricant which flows through the filter 45 flows through the opening 131 and then axially of the stud member 34 through passageway 130. The passageway 130 opens into the gear chamber and the lubricant, after being filtered, flows back into the gear chamber. The end of the stud member 34 has a projecting U-shaped hood portion 135 which projects into the gear chamber and which assists in directing the fluid back into the gear chamber. The fluid which is directed back into the gear chamber flows into the gear chamber adjacent the annular portion 20 of the gear 14, and the stud members 33, 34 are somewhat staggered with respect to the vertical and do not lie on a vertical line.

From the above, the operation and function of the filter unit should be clear. It should be apparent that as the gear 14 rotates through the lubricant reservoir, lubricant is picked up by the gear portion 20 and by the gear teeth of the gear 14 and is slung, splashed or otherwise conveyed into the passageway 120 in the stud member 33. This lubricant flows through the filter portion 45 and is filtered thereby and the filtered lubricant then flows through the passageway 130 back into the gear chamber. Any dirt or impurities which are filtered from the lubricant may fall into the lower portion of the filter housing 31 and may be removed therefrom upon replacement of the filter element.

It will be noted that the present invention provides an improved vehicle drive mechanism of the type which utilizes a power transmitting gear member which rotates in a lubricant reservoir for the distribution of lubricant to the various parts of the axle. The mechanism includes a simple, yet reliable filter unit for removing dirt and other particles from the lubricant.

WHAT WE CLAIM IS:—

1. A vehicle drive mechanism comprising an axle housing containing a gear chamber and defining a lubricant reservoir in its lower part, a lubricant distribution system having means for removing lubricant from the reservoir and directing it to various parts of the mechanism, and a filter unit in the distribution system, which unit comprises a separate filter housing connected to the axle housing by stud members having lubricant-directing passageways therein which form the lubricant inlet and outlet for the filter housing, and an annular filter element extending across the filter housing and surrounding the outlet stud member.

2. A mechanism as claimed in Claim 1 wherein each stud member has a shoulder portion against which the filter housing is clamped by a nut engaging the free end of the stud member.

3. A mechanism as claimed in Claim 1 or Claim 2 further comprising means to prevent rotation of the stud members.

4. A mechanism as claimed in Claim 3 wherein the means for preventing rotation of the stud members comprises a pair of nut members threaded respectively on to the stud members and a strap members extending between the nut members and

having portions engaging flats on the nut members to prevent rotation of these nut members.

5. A mechanism as claimed in any preceding claim wherein the filter housing has a removable cover member covering an opening through which the filter element may be removed and replaced.

6. A mechanism as claimed in Claim 5 wherein a reinforcing ring member secured to the filter housing extends around the opening, the cover member and filter element being secured in position by threaded fasteners located in openings in the cover member, a flange portion of the filter element and the reinforcing ring.

7. A mechanism as claimed in any one of the preceding claims including a rotatable member having lubricant pick-up surface extending into the reservoir for picking up lubricant in the reservoir and conveying it to a discharge location.

8. A mechanism as claimed in Claim 7 wherein said inlet stud member has a U-shaped hood projection which extends into the axle housing towards the annular pick-up surface for receiving lubricant therefrom.

9. A vehicle drive mechanism substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1971.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY
from which copies may be obtained.

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Sheet 1

Fig.1.

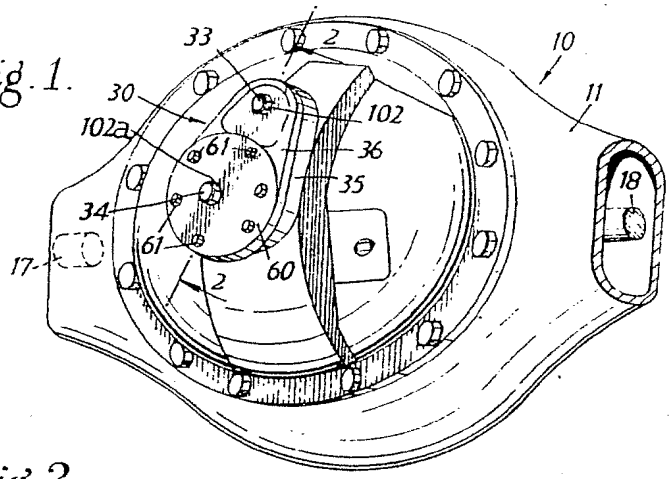


Fig.2.

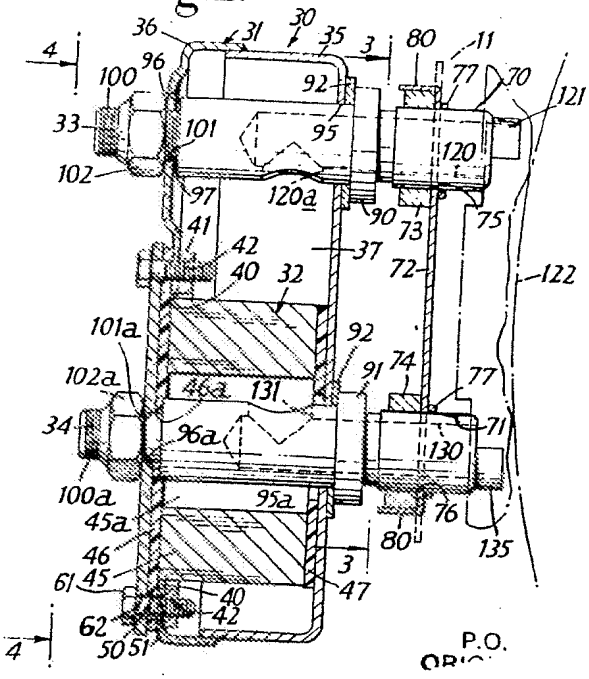
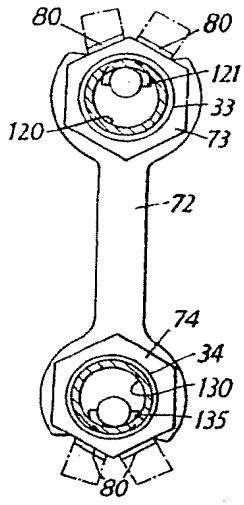


Fig.3.



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Sheet 2

Fig.4.

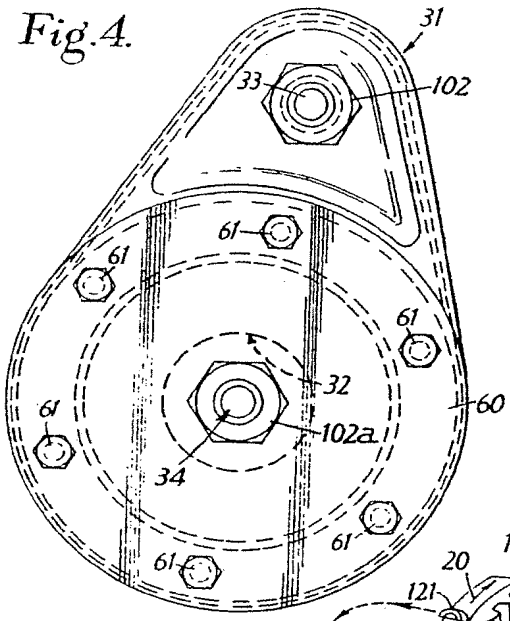

Fig.5.

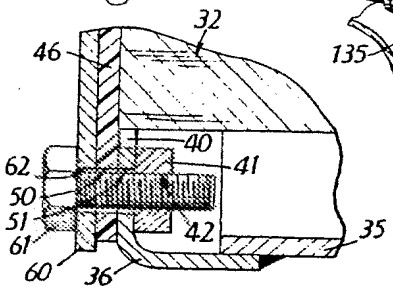

Fig.6.